



Effects Of Shockwave Therapy on Reducing the Muscle Tone in A Patient with Multiple Sclerosis: A Case Report

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ABSTRACT

This case study involved a young patient who was given a multiple sclerosis diagnosis. Briefly, the patient arrived at the clinic complaining of facial tingling and other electricity-related symptoms. After collapsing twice, the patient was sent to the intensive care unit.

Purpose: To evaluate the effects of shockwave on reducing the tone in a patient diagnosed with multiple sclerosis.

Method: Before the intervention, the patient's muscle power was low, and his muscle tone was high. The patient received Ocrelizumab and 30 mg of Baclofen. The patient was also instructed to do strengthening and stretching exercises at home and clinic. The shock wave was used to decrease the tone of the biceps and hamstring muscles. The goal of the treatment was to help the patient walk more safely and with better balance. The patient's symptoms subsided following treatment, and he could walk without incident.

Result: The findings of the case report suggest that extracorporeal shock wave therapy was beneficial in reducing hypertonia among a young male patient diagnosed with multiple sclerosis. However, the patient was also given oral medication. It is not clear whether shock therapy alone improved the symptoms or reduced muscle tone could also be due to oral medications and lifestyle changes such as exercise.

Conclusion: Proportion of reduction in muscle tone attributed to shock wave therapy cannot be estimated and needs to be evaluated further in future studies.

Keywords: *Multiple sclerosis, Muscle tone, Shock wave*

INTRODUCTION

Multiple sclerosis is a prevalent non-traumatic brain and spinal cord disease affecting around 3 million people worldwide (1). The condition is three times more common in females than males and is typically prevalent among young adults (2). The incidence of multiple sclerosis is on the rise both in developed and developing countries, with negative socioeconomic consequences of

the disease (3). Multiple sclerosis (4), an inflammatory demyelinating condition, occurs due to myelin damage (5). Due to the loss of myelin, disruption occurs in the ability of nerves to transfer electrical impulses from and to the brain. Following inflammation, multiple sclerosis leaves several scars on the brain and spinal cord (5, 6).

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balance, and fatigue (7). The disease is progressive in nature; however, it is characterized by episodes of relapse and remission in some patients (8, 9).

The etiology of multiple sclerosis is less understood; however, intricate gene-environment interactions play a critical role in the occurrence of the disease (10, 11). Further, the evidence suggests that factors such as low serum vitamin-D levels, smoking, infection with the Epstein-Bar virus, and childhood obesity play an essential role in developing multiple sclerosis (8, 10). Unfortunately, this disease has no cure, as no drug or medication can cure multiple sclerosis (7, 12). However, treatment is available that can modify the course of the disease. Several pharmacological and non-pharmacological treatments have been tested (12, 13). For example, historically, immunosuppressants or immunomodulatory immune reconstitution therapies have been tried to produce long-lasting immunological actions (7, 12). Additionally, symptomatic treatments have also been studied, and the evidence suggests that anticholinergic drugs for neuropathic pain may be helpful (12-14).

One of the typical clinical signs among patients with multiple sclerosis is increased muscle tone or hypertonia that negatively influences the quality of life of the patients (15). Muscle hypertonia affects about 80% of patients with multiple sclerosis and is often very painful (16). In addition, It may hinder the patients' daily activities, leading to various complications such as impaired mobility, gait disturbances, and joint contractures (15, 17). Further, hypertonicity can also cause rigidity in joints and bladder dysfunction, resulting in nocturnal awakening due to pain or bladder dysfunction (18). Bladder dysfunction and negative influence on daily activities can badly affect a patient's social, vocational, and sexual activities (15, 17). These impacts on everyday life warrant managing hypertonia among patients with multiple sclerosis.

Different measures have been suggested to manage abnormal muscle tone among Multiple Sclerosis patients. However, only a few methods have been proven successful, with limited evidence from well-conducted studies. For example, exercise or physiotherapy strategies such as Bobath or Brunnstrom techniques have been recommended but have yet to be studied

extensively (17). Hence, there is scarce evidence supporting lifestyle modifications to improve the symptoms and quality of life of patients with MS, mainly improving the muscle tone of the patients (12, 13). Despite insufficient evidence, patients who exercise do better than those who do not (12). Hence, patients must be encouraged to exercise to improve power and decrease muscle tone (12, 19). However, exercise should be avoided during the relapse as it can increase neuroaxonal loss (12). Since physiotherapy or exercise alone may not be sufficient for most patients, medications such as baclofen or tizanidine are widely recommended to reduce muscle tone (20, 21). However, other antispastic drugs, such as benzodiazepines, are rarely prescribed due to adverse effects such as sedation and dependence (22, 23). In addition, antispastic medications are of limited value in localized or focal spasticity (17). Recently, shock wave therapy has been used for patients to treat hypertonia and uses pressure waves produced through electro-hydraulic, electromagnetic, and piezoelectric sources (24, 25, 26, 27). However, the role of shock wave therapy in improving muscle tone among patients with multiple sclerosis is limited. Only one RCT has found the effect of shock therapy in improving muscle tone among multiple sclerosis patients (4). Also, exercise can be integrated with shock wave therapy, has been found helpful in improving muscle tone, and has been successfully used for various musculoskeletal disorders (28). Therefore, shock wave therapy may prove beneficial for the patient if performed under the guidance of a trained healthcare provider. Through the following case report, the aim was to evaluate the effects of shockwave on reducing the tone in a patient diagnosed with multiple sclerosis.

Description Of The Case

Majmaah University ethically approved the case report "MUREC-Jan.02/COM-2023/23-3, and Informed Consent was explained and signed by the patient..

In 2018, a 25-year-old male patient with no previous medical history started to complaining of an "electricity-like feeling on the right side of the face." In early 2020, the patient started to observe the deterioration and the difference in his functional activity. This was reflected by changes in his routine activities, such as being

unable to hold the playing cards and playing the Oud due to weakness and increased muscle tone. In addition, the patient started to lose his balance and could not walk normally. In April 2020, the patient joined the rehabilitation center due to severe weakness and deterioration in functional activities.

After joining the rehabilitation center, the patient showed more remarkable improvement and could walk independently without assistance. However, after two weeks of discharge from the center, the patient's health deteriorated, and he started using a single cane to support his ambulation. Unfortunately, the patient collapsed in September 2021 and was admitted to the intensive care unit for one day. The patient improved gradually. However, in April 2022, the patient collapsed again for three days. This was followed by his visit to a neurologist who evaluated the patient thoroughly. After several investigations, the patient was diagnosed with multiple sclerosis. The neurologist prescribed Ocrelizumab as an injection every six months. After getting the treatment (i.e., Ocrelizumab and Baclofen 30 mg), the patient's general activity improved.

Patient's Assessment

Upon assessment, I found that the patient visited the clinic walking with a single cane and stopped after taking a few steps due to fatigue and low endurance. In addition, there was weakness in the left side of the body (both upper and lower extremities) and the left arm was flexed, and internally rotated with fair balance.

Gait Analysis

On the gait analysis, the patient was walking slowly, taking short steps with the support of a

single cane. There was a little weight bearing on the left side.

Muscle Tone, Range Of Motion, And Sensation

A modified Ashworth scale was used to measure muscle tone. Left knee flexion, left elbow flexion, left supination, and left wrist flexion was two each. The muscle tone was found to be standard on the right side. All joints' passive range of motion was complete, and the sensation was intact.

Balance and Functional Gait Assessment

Activity specific balance confidence (ABC) scale was used to assess the balance, and the patient scored of 44.37%. Moreover, the functional gait assessment score was 8/30 using a single cane. The FGA is a valid measure of balance during walking in people with MS (29). The ABC scale has demonstrated high test-retest reliability with an intraclass correlation coefficient of 0.93 to 0.95(30, 31). Similarly, the scale's validity among patients with multiple sclerosis is moderate to good (0.5 to -0.75) (30).

Postural Sway

The patient was asked to stand on a stable sensory platform "ISO-FREE" system that detects postural sway velocity and translates to degree/seconds to assess his postural sway. The within-subject reliability, assessed through coefficients of variance, is highest, as reported by the coefficient of variation of 34.8 to 79.4% (32). The sway index for open eyes' firm surface was 0.98°. Similarly, the sway index for closed eyes' firm surface was 1.81°. On the other hand, the sway index for open eyes foam surface was 1.15°, and for closed eyes foam surface, it was 1.70° as shown in Figure 1.

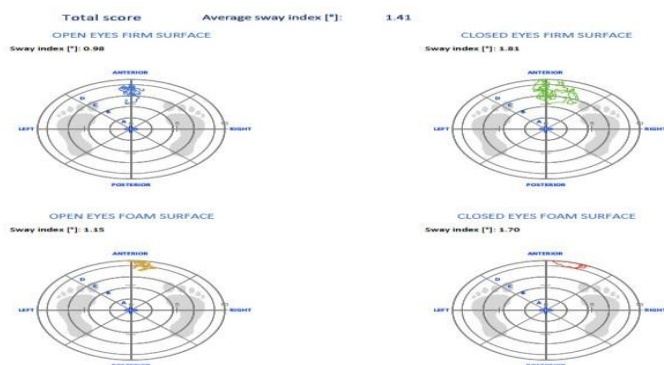


FIGURE 1: Pre-assessment of the sway index in four conditions

Daily living Activities

The patient can drive alone and is independent in performing his activities. However, the patient needs more time to perform and finalize his tasks.

Treatment Goals and Plan of Care

While exploring the patient's goals, the patient wanted to see improvement in his balance, a decline in muscle tone, and ability to walk safely and play cards, and Oud as his routine hobbies.

The patient's care provider sets goals for the patient. These goals include reducing muscle tone on the left side of the body, including knee, elbow, and wrist flexion and forearm supination muscles. The second goal focused on helping the patient to walk safely with improved balance. The patient's plan of care was to have therapy at a rehabilitation clinic three times a week for one hour for six weeks for rehabilitation that includes the following intervention with the home exercise program.

Intervention/Treatment given to the Patient and Home Exercise Program

The patient was given a shock wave to decrease his muscle tone over the flexor group of muscles in upper extremities; biceps, brachioradialis, flexor ulnaris and radialis, also wrist flexor group. The shock wave application was given 2 time/ week as 3000 shots for total muscles with using energy of 0.03 mJ/mm². For the flexor group of lower extremities muscles; hamstring, gracilis, sartorius, gastrocnemius, plantaris 500 shots of shock wave was applied for each muscle 2 times / week with using energy of 0.089 mJ/mm². Further, stretching exercises were advised for the left upper and lower extremities. These exercises included active range of motion exercises on the left side and using weight and TheraBand as a resisted range of motion exercises on the right-hand side ten

times for two sets. In addition, the coordination exercise and balance training were included, where the patient had to sit on the Swiss ball, bounce on it, and control his balance for 2 minutes. The patient was also instructed to stand on a side parallel bar by performing different exercises such as walking backward and on the sidewalk, squatting, and stepping oversteps weight-shifting exercises. Apart from these interventions, other exercises included vestibular adaptation exercise (adaptation and substitution ex for 3-5 repetitions, Floor transfer exercise, walking training using a single cane, and stair training by holding the right side handrails. The patient wore a gait belt during the therapy session for safety considerations. At home, the patient was advised and encouraged to get engaged in strengthening exercises for both upper & lower extremities, stretching exercises for both upper & lower extremities ten times for three sets /day, and vestibular adaptation exercise (adaptation and substitution ex) for 3-5 times / one set and repeated three times/day.

RESULTS

Gait Analysis, Balance, and Functional Gait Assessment

Upon the gait analysis, the patient could walk with left foot clearance and long steps at a relatively faster speed and less fatigue than before treatment. The balance score was 61.87% using the activities-specific balance confidence (ABC) scale. Upon assessing the functional gait, he scored 13/30 using a single cane.

Postural Sway

The sway index for open eyes' firm surface was 0.78°. Similarly, the sway index for closed eyes' firm surface was 0.63°. On the other hand, the sway index for open eyes foam surface was 0.61°, and for closed eyes foam surface, it was 1.31°, as shown in Figure 2.

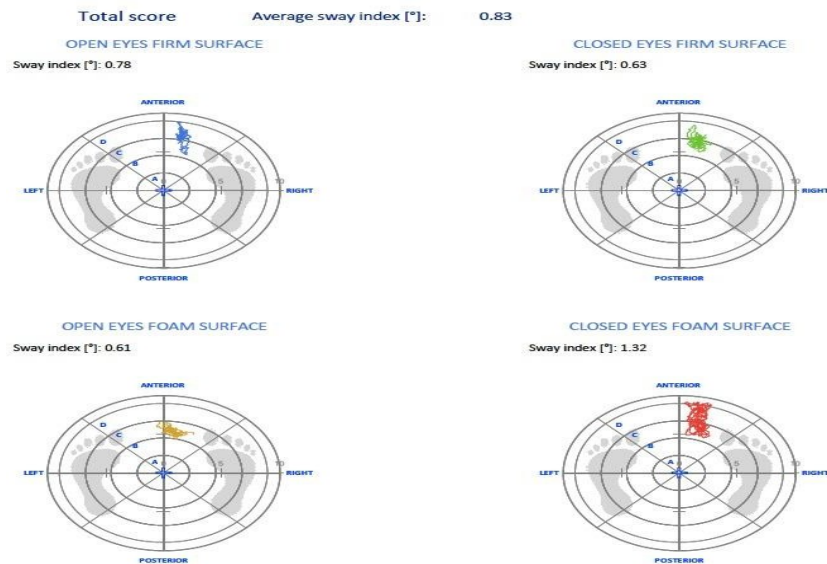


FIGURE 2: Post-assessment of the sway index in four conditions

Muscle Tone

The muscle tone of the patient was measured using the modified Ashworth scale. It was found that left knee flexion, left elbow flexion, left forearm supination, and left wrist flexion scored one on the muscle tone assessment.

DISCUSSION

Since the patient in the current case report had increased muscle tone, the goal was to decrease the muscle tone by using extracorporeal shock wave therapy so the patient could perform regular activities and spend his life smoothly. The findings of the case report reveal that shock wave therapy was beneficial in decreasing the muscle tone of the patients. Our results are affirmed by the existing literature, where evidence indicates that shock wave therapy helps to reduce muscle tone and also helps in pain reduction(4). For example, a systematic review found shock wave therapy beneficial for improving muscle tone in patients with multiple sclerosis (33). In addition, a recently published meta-analysis suggests that extracorporeal shock wave therapy is efficacious in alleviating spasticity in patients with upper motor neuron lesions. However, only one study focused on multiple sclerosis, and the remaining ones included patients with cerebral palsy or stroke(34). Similarly, findings from a case series suggest extracorporeal shock therapy's beneficial effect in reducing muscle tones among patients with chronic hemiplegia(35).

The benefit of shock wave therapy in improving muscle tone among patients with multiple sclerosis is due to the role of shock therapy in the passive range of motion by breaking the link between myosin and actin. Consequently, the intrinsic rigidity of connective tissue and increasing the extensibility of muscles (36, 37).

While the literature suggests that multiple sclerosis is common among young adults(38), particularly females, the case presented in this report was young but male, which contradicts the sex ratio for multiple sclerosis in the literature(38, 39). The literature also highlights that smoking, exposure to Epstein bar virus, and obesity are risk factors for multiple sclerosis (38). However, the patient was neither smoker nor obese and had been exposed to the virus. This implies that some other unknown factors may play a role in causing multiple sclerosis. These factors need to be explored in the future. In addition, the etiology or causes of multiple sclerosis may vary based on different geographic areas. Therefore, one should remember that multiple sclerosis can occur among young male patients with unusual symptoms. Also, a single management strategy may not work for patients presenting with hypertonia. Instead, an integrated approach needs to be adapted to improve the patient's symptoms and help them gradually perform routines of physical activities.

This case report suggests that extracorporeal shock wave therapy was beneficial in reducing hypertonia among a young male patient

diagnosed with multiple sclerosis. However, the patient was also given oral medication. Therefore, it is unclear whether shock therapy alone improved the symptoms or reduced muscle tone could also be due to oral medications and lifestyle changes such as exercise. Hence, what proportion of reduction in muscle tone attributed to shock wave therapy cannot be estimated and needs to be evaluated further in future studies.

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Conflict of Interest

The authors declare no conflicts of interest.

Author Contributions

NA

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